SYNOPSIS

The thesis entitled "EXISTENCE AND EVALUATION OF ZERO AND PI BY MATHEMATICIANS" is an attempt to find out the historical reasons for the discovery of zero and pi from the bottom of the history of mathematics by the help of significant contributions of world's famous mathematicians.

This work consists of 5 chapters. Chapter 1 is an introduction of the history of Mathematics. The history of science and specifically mathematics is a vast topic and one which can never be completely studied as much of the work of ancient times remains undiscovered or has been lost through time. Mathematics is constantly developing, and yet the mathematics of 2,000 years ago in Greece and of 4,000 years ago in Babylonia would look familiar to a student of the twenty-first century. Nevertheless there is much that is known and many important discoveries have been made the last years. By the turn of the every century it was fair to say that there was definite knowledge of where and when a vast majority of the significant developments of mathematics occurred. This chapter consists significant contributions by great Indian mathematicians and world's famous mathematicians.

Chapter two is about the existence and history of zero. It was about the journey of zero, its symbols, discovery, uses etc. It was first thought about in Babylon, India and in Central America at different times. Some places and countries did not know about a zero, which may have made it harder for those people to do mathematics. Over hundreds of years the idea of zero was passed from country to country. From India and Babylon to other places

like Greece, Persia and the Arab parts of the world. The Europeans learned about zero from the Arabs. First recorded zero appeared in Mesopotamia around 3 B.C. The Mayans invented it independently in 4 A.D. It was later devised in India in the mid-fifth century, spread to Cambodia near the end of the seventh century, and into China and the Islamic countries at the end of the eighth. Zero reached western Europe in the 12th century.

Zero began its career as two wedges pressed into a wet lump of clay. The first evidence we have of zero is from the Sumerian culture in Mesopotamia, some 5,000 years ago. There, a slanted double wedge was inserted between cuneiform symbols for numbers. In today's modern mathematics, we have become accustomed to zero as a number. It's hard to believe that most ancient number systems didn't include zero. The Mayan civilization may have been among the first to have a symbol for zero. The Greek astronomer Ptolemy was the first to write a zero at the end of a number. The most fundamental contribution of ancient India to the progress of civilization is the decimal system of numeration including the invention of the number zero used in Vedas and Valmiki’s Ramayana, Mohenjo-Daro and Harappa civilizations. We can say that the zero has development on its way toward becoming an important number in the history of mathematics

Chapter 3 is about existence of $\boldsymbol{\pi}$ a mathematical constant whose value is the ratio of any circle's circumference to its diameter in the Euclidean plane; this is the same value as the ratio of a circle's area to the square of its radius. It is approximately equal to 3.14159265 in the usual decimal notation. Many formulae from mathematics, science, and engineering involve π, which makes it one of the most important mathematical constants. One of the earliest known records of pi was written by Egyptian named

Ahmes which is now called as Rhind Papyrus. π is an irrational number, which means that its value cannot be expressed exactly as a fraction *m*/*n*, where *m* and *n* are integers. Consequently, its decimal representation never ends or repeats. Proving this was a late achievement in mathematical history and a significant result of 19th century German mathematics. Throughout the history of mathematics, there has been much effort to determine π more accurately and to understand its nature; fascination with the number has even carried over into non-mathematical culture.The Greek letter π was first adopted for the number as an abbreviation of the Greek word for *perimeter* by William Jones in 1706. The constant is also known as Archimedes' Constant, after Archimedes of Syracuse who provided an approximation of the number.

The first theoretical calculation seems to have been carried out by Archimedes of Syracuse Before giving an indication of his proof, notice that very considerable sophistication involved in the use of inequalities here. Archimedes knew what so many people to this day do not that π does not equal 22/7 and made no claim to have discovered the exact value. If we take his best estimate as the average of his two bounds we obtain 3.1418, an error of about 0.0002. Shanks knew that pi was irrational since this had been proved in 1761 by Lambert. Shortly after Shanks' calculation it was shown by Lindeman that pi is transcendental, that is, pi is not the solution of any polynomial equation with integer coefficients. In fact this result of Lindeman showed that 'squaring the circle' is impossible.

Chapter four is about the different methods of calculating the value of pi. Archimedes' method is perhaps the easiest way to begin to calculate the value of π. It is the method that can appeal to one’s intuition to integral

calculus. He was also the first to give a method of calculating π to any desired degree of accuracy. It is based on the fact that the perimeter of a regular polygon of n sides inscribed in a circle is smaller than the circumference of the circle.

The Babylonians method is that the perimeter of a hexagon is exactly equal to six times the radius of the circumscribed circle, in fact that was evidently the reason why they chose to divide the circle into 360 degrees The tablet, therefore, gives the ratio 6r/C, where r is the radius, and C the circumference of the circumscribed circle i.e., the value the Babylonians must have used for π to arrive at the ratio given in the tablet.

Egyptian method of calculating π is a value only very slightly worse than the Mesopotamian value 3 1/8, and in contrast to the latter, an overestimation. The Egyptian value is much closer to 3 1/6 than to 3 1/7, suggesting that it was neither obtained nor checked by experimental measurement.

There is much indirect evidence of Hindu mathematics that Hindu astronomy was at a highly advanced level. First available documents are the Siddhantas. Early Hindu knowledge was summarized by Aryabhata in the Aryabhatiya, This gives the solutions to many problems without a hint of how they were found value of π .The extraordinary brilliant mathematician ramanujan made contribution to generation of the value of pi.

Tsu Chung-Chih and his son Tsu Keng-Chih found $3.1415926 < \pi < 3.1415927$, an accuracy that was not attained in Europe until the *16th* century. The important point is that the Chinese, like Archimedes, had found

a method that, in principle, enabled them to calculate π to any desired degree of accuracy.

Viete was the first in history to represent π by an analytical expression of an infinite sequence of algebraic operations. As a matter of fact, he was also the first to use the term "analytical" in mathematical terminology, and the term has survived. The idea of continuing certain operations ad infinitum was of course much older. Archimedes had used it, and it should be noted that Viete's formula is of almost no use for numerical calculations of π, the square roots are much too cumbersome, and the convergence is slow.

Chapter five is about various application of π in varieties of the ways. This will involve some unusual properties of the circle, which determines π, also pi in sports, the unique seven circles arrangement, the use of pi in the construction of the great pyramids.

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